

terms; it may, however, radically change the distribution of particular organisms on the platforms from time to time.

One can only speculate about how long it will be before the previous associations are re-established, if at all. Experience with experimental removal of limpets indicates that many years may elapse before these animals again dominate some of the areas from which they have been eliminated, and other animals will doubtless take time to recolonise their habitats. This large scale natural experiment will be watched with great interest.

[Note: Relevant tidal data will be found in: Hodgkin, E. P., and V. Di Lollo, 1958, The Tides of South-Western Australia. *J. Roy. Soc. W. Aust.*, 41: 42-54. A short description of the Rottneest reefs and the intertidal fauna and flora will be found in: Hodgkin, E. P., L. M. Marsh and G. G. Smith, 1959, The Littoral Environment (of Rottneest). *J. Roy. Soc. W. Aust.*, 43 (in press).]

HERPETOLOGICAL MISCELLANEA

By L. GLAUERT, Western Australian Museum, Perth.

X.—DRAGON LIZARDS (FAMILY AGAMIDAE)

Small dragon-like lizards having the head covered with small scales and those on the body and limbs overlapping. Limbs with five digits, the anterior at times reduced but still functional. Tail long and occasionally as much as three times the length of the head and body, terminating in a fine point, can be replaced when lost but not shed. Teeth situated on the top of the jaw, not attached to the side as in the other families of lizards.

KEY TO THE GENERA

- I. Body covered with normal scales.
 - A. No preanal or femoral pores, no transverse gular fold, pouch in the male *Chelosania*
 - AA. Preanal pores present, transverse gular fold present or absent, no gular pouch.
 - B. Tympanum hidden *Tympanocryptis*
 - BB. Tympanum distinct.
 - C. Preanal and femoral pores at least in the males, body depressed *Amphibolurus*
 - CC. No femoral pores, body slightly depressed *Diporiphora*
 - D. Body compressed, toes denticulate laterally *Physignathus*
 - DD. Body compressed, neck with large frill *Chlamydosaurus*
- II. Body covered with large spines *Moloch*

Chelosania brunnea Gray

Thick-headed Dragon Lizard

Head large, cheeks swollen, covered above with small rough tubercles. Nostril equally distant from the eye and the tip of the

snout, labials very small, eye small, ear opening smaller. Scales on the body small, overlapping, forming regular transverse rows. Dorsal and gular scales with a short keel or tubercle. Ventrals strongly keeled. A slight nuchal crest. Limbs short, the adpressed hind limb reaches the axilla. Tail longer than the head and body, strongly keeled. Pale brown. Length up to $10\frac{1}{2}$ in. (265 mm.).

Distribution: In this state confined to the Kimberley Division where it seems to be rare.

Genus *TYMPANOCRYPTIS*

Small lizards, less than 6 in. (150 mm.) in length, are distinguished from all other members of the family by the absence of an external ear opening. No dorsal crest; covered above with smooth or keeled scales intermixed with spinose tubercles. Ventral scales keeled or smooth. Strong gular fold often present. Body more or less depressed, stout. Tail round, flattened and expanded at the base. A preanal and a femoral pore on each side may be present in both sexes.

KEY TO THE SPECIES

- A. Body stout, much depressed, dorsal scales smooth or with slight keels intermixed with blunt tubercles, ventrals smooth or faintly keeled *cephalus*
- AA. Body less stout, depressed, dorsal scales strongly keeled intermixed with spinose tubercles, lower surface with strong keels. Five white lines along the body *lineata*

Tympanocryptis cephalus Gnthr.

Brown Earless Dragon

Body stout, scales on the head large, faintly keeled or granular, dorsal scales smooth or feebly keeled, the tubercles mucronate and spinose. Body brown above with more or less distinct darker cross bands which are also present on the limbs and tail where the interspaces are much paler. Under surface and inside of the limbs pale, almost white. Grows to about $5\frac{1}{2}$ in. (140 mm.).

Distribution: Very widely distributed in the southern interior of the State, east of the agricultural area, north to Mardie Station and the Canning Stock Route, south to the Kalgoorlie area and eastwards beyond the boundary of the State. The type locality is Nickol Bay.

Tympanocryptis lineata Peters

Streaked Earless Dragon

Body less stout, depressed, dorsal scales strongly keeled, intermixed with spinose tubercles, lower surface with strong keels to the scales. Usually five white lines along the body, the three dorsal extending from the head on to the tail, the lateral, which may be very faint or even absent, reach from the axilla to the groin. Two colour forms may be distinguished. (1) Head light brown, body brownish with about six more or less distinct darker cross bands on the body

with others on the tail. This is the typical form. (2) Head pale with a rufous patch on the snout, another in front of the eye and a third on the nape; the back is greyish with wide brown crossbands extending on to the tail where they become indistinct. Grows to 5½ in. (140 mm.).

Distribution: The single specimen, R11752, in the collection is said to have come from the Ord River Research Station in East Kimberley although the genus is a southern form. On the other hand the single paler specimen representing Sternfeld's *Tympanocryptis lineata centralis*, R12222, comes from 49 miles east of Goddard's Creek, in the south-east of the state.

More specimens of this species are urgently needed to provide fuller details of its distribution.

Chlamydosaurus kingii Gray Frilled Lizard

This, the largest of the Dragon Lizards, may attain a length of nearly 3 feet. Its most striking characteristic is the bright coloured frill on its neck. This when expanded, in combination with the bright yellow mouth, gives the creature a terrifying appearance, the effect being heightened by a loud hiss. The head is long and pointed, body slender, fore limbs short, hind limbs long, which when adpressed reach the tympanum or the eye. Tail long slightly compressed, nearly twice as long as the head and body.

Distribution: This lizard has a wide range in the tropical north; it is known from Queensland in the east to West Kimberley in the west.

Moloch horridus Gray Mountain Devil

A most bizarre creature; head, mouth, eyes and ears small, body broad and depressed, limbs short, the adpressed hind limb not reaching the axilla, tail tapering ending bluntly, shorter than the head and body. Head, body, tail and limbs above with large sharp spines and granular scales; under surface with the chin, throat and tail covered with granular scales, belly with keeled scales and short spinose tubercles. Colour very variable. The ground colour in fully coloured reptiles is a bright yellow or orange with elongated chocolate-brown cross bands on the body; the cross bands are continued down the sides of the body. Reported to grow to 8 in. (205 mm.).

Distribution: This lizard has a very wide range in the southern half of the State, east of the Darling Range into southern and central Australia.

Genus *PHYSIGNATHUS*

Dragon lizards of somewhat elongate form, the long hind legs when adpressed reaching the eye or beyond, the hind foot about as long as the fore limb. Tail roundish. Two or three preanal pores and a number of femoral pores on each side.

Small specimens are easily mistaken for *Diporiphora*.



Frilled Lizard (specimen from Hall's Creek). Frill folded.



Frilled Lizard with neck frill expanded.

—Photos V. N. Serventy.

KEY TO THE SPECIES

- A. Keels on the rather large dorsal scales forming lines parallel to the crest or vertebral line *gilbertii* (Gray)
- AA. Keels on the rather smaller dorsal scales forming lines obliquely directed to the vertebral line.
 - b. Head long and narrow, the nostril nearer to the eye than to the tip of the snout *longirostris* (Blng.)
 - bb. Head normal, the nostril not nearer to the eye than to the tip of the snout *eraduensis* Werner

Physignathus gilbertii (Gray)

Gilbert's Water Dragon

Head rather elongate compared with other dragons but normal for this genus, the species *longirostris* excepted. Snout about as long as the distance between the orbit and the hind margin of the tympanum; nostril a little nearer to the orbit than to the tip of the snout; cheeks swollen with a few erect spines behind. Upper head scales strongly-keeled, largest on the snout and between the eyes, very small on the back of the head and nape. Dorsal scales imbricate, keeled, the median ones largest, the keels forming rows more or less parallel to the vertebral line or crest. Dorso-lateral scales smaller, their keels directed obliquely upwards. Dorsal crest forms a small serrated ridge which does not extend on to the tail. Ventral scales keeled, smaller than the largest dorsals. Limbs long, the adpressed hind limb reaches to the eye, covered above with strongly keeled scales. Two to four femoral and two or three preanal pores on each side. Tail covered with strongly keeled scales, the keels forming parallel longitudinal rows tapering to the tip, the scales on the lower surface somewhat larger with the keels less developed. Grows to about 20 in. (500 mm.).

Colour very variable, changing considerably after preservation in alcohol, the white markings on the head and body being the most persistent. These start as a broad whitish or pale yellow band embracing both the upper and lower tips, widening at the swelling and then proceeding upwards to join the thin stripe from the eye and forming the prominent pale band which in most cases extends to the base of the tail. There may be indistinct dark blotches or cross bands on the body and dark rings or cross bars are usually present on the tail and limbs. The under surface may be uniformly pale, peppered with darker or even entirely brownish.

The arrangement of the keels on the central dorsal scales to form rows parallel to the vertebral line distinguishes this species from all the others of the genus.

Distribution: Very wide in the northern part of the State as far south as the Pilbara.

Physignathus longirostris (Blng.)

Long-snouted Water Dragon

This lizard is easily distinguished from Gilbert's Dragon by its long slender head and smaller mid-dorsal scales which have their

keels arranged in rows obliquely to the vertebral line instead of parallel to it. The nostril is nearer to the eye than to the tip of the snout and the snout is longer than the distance between the orbit and the posterior border of the tympanum. Upper head scales strongly keeled, smaller on the back of the head, smaller still on the nape where they resemble the dorsals. Nuchal crest consisting of a few enlarged scales continued along the body and tail as a low ridge. Gular scales fairly keeled, ventrals more strongly so. Limbs long, the adpressed hind limb reaching the nostril or tip of the snout. Tail long, up to three times the length of the head and body, its scales strongly keeled, the keels forming rows to the tip. Grows to about 15 in. (380 mm.).

The colour is very variable and changes during the mating season when a more gaudy coat is assumed. The colour is olive or reddish brown above. A light stripe on the lower lip bends up behind the jaw to join the whitish dorso-lateral band which extends to the base of the tail. A black patch behind the ear encloses a pale spot which may be white or yellowish white in life. In the nuptial dress the temporal region and the middle of the back may be a rich plum colour. This decoration gradually fades away when the specimen is preserved in alcohol. There is a phase in which the upper surface is rufous brown with numerous dark spots; a little later pale ones appear until at last the upper surface between the pale dorso-lateral bands becomes a pale brown with large dark blotches which almost form transverse bands across the dorsal surface. The under surface may be immaculate or peppered with darker, contrasting sharply with the whitish lower labials.

A specimen, R12621, in the Museum Collection caught at Woodstock Station in September 1957 was rufous along the back between the dorso-lateral bands, the rest of the upper surface, the head, limbs and tail being somewhat paler. By the end of the following December the centre of the back had changed in spirits to dresden brown and darker brown pale patches had begun to appear. It must be noted that the thin whitish line along the side of the body from the adpressed fore limb to the groin described in Sternfeld's description of *Physignathus longirostris quattuorfasciatus* is well developed.

The species is found in daylight under stones or other materials. It can run actively if disturbed, will climb trees or bushes and if these overhang will readily drop into the water below and swim to the other side of the creek to safety.

Distribution: The range appears to be more or less restricted to the interior. The material in the Museum comes from the Canning Stock Route, the Pilbara, Shark Bay area and south to the Gascoyne and Upper Murchison.

Physignathus eraduensis Werner Eradu Water Dragon

Head normal, not elongate, the nostril equidistant from the eye and the tip of the snout; distance between the eye and the tip of the snout about equal to the distance between the eyes and the hind margin of the tympanum. Tympanum more than half the diameter

of the orbit. Dorsal scales small, strongly keeled, the keels arranged in rows oblique to the vertebral line; ventrals somewhat smaller than the dorsals, strongly keeled. Nuchal crest low, reduced on the back to a very low ridge. Limbs long, the adpressed hind limb reaching the nostril. Five femoral and two preanal pores on each side in the male. Size small about $9\frac{1}{2}$ in. (236 mm.).

Colour of specimens preserved in alcohol grey brown with a series of large dark blotches almost forming cross bands ending laterally; a pale band extending along the body to the root of the tail; a narrower band along the lower labials bends up posteriorly to link up with this behind the jaw.

Distribution: The type locality is Eradu; specimens in the Museum Collection are from the Greenough River and Galena.

Genus *DIPORIPHORA*

Tympanum distinct. Body slightly depressed, no gular sac, gular fold present or absent. Tail long, round, slender. One or two preanal pores on each side, sometimes absent in the females. No femoral pores. Nuchal crest usually absent.

KEY TO THE SPECIES

- A. Prominent nuchal crest and odd series of flattened spines along the body and tail *amphiboluroides*
- AA. No prominent nuchal crest.
 - b. Habit slender, blue vertebral band *winneckei*
 - bb. Habit stouter, no blue vertebral band *bilineata*

Diporiphora bilineata Gray

Gray's Dragon

Habit normal, head large with distinct canthus rostralis, covered above with keeled scales, largest between and behind the eyes, a more or less distinct crest from under the eye to over the ear, a slight oblique fold on each side of the neck, gular fold present or absent. Dorsal scales large, strongly keeled, forming rows which gradually converge on the vertebral line. Gular and ventral scales keeled. Limbs and feet moderate, scales strongly keeled, the ad-



Gray's Dragon (australis form of *Diporiphora bilineata*)

—Photo Eric Lindgren.

pressed hind limb reaches the ear or the eye. Tail covered with large strongly keeled scales, about two and a half times as long as the head and body, often imperfect. Grows to about 10 in. (260 mm.). Head and body 3 in. (75 mm.), tail 7 in. (185 mm.).

The colour is very variable as is indicated by a large series from Wotjulum in West Kimberley. Spirit specimens may have a body colour of pale olive brown with about six dark brown cross bands interrupted by two or three white longitudinal lines, the two outer of which extend on to the tail. This form has the limbs and tail with dark cross bands and may have a dark blotch on each side of the neck and shoulders. The under surface may be pale and immaculate or with the chin peppered darker.

There is every gradation from this type to the other extreme with the body almost uniformly brownish above with indications of imperfect darker cross bands. There too the darker shoulder patch may be present or absent; the darker markings are more distinct upon the somewhat paler tail. These various colour forms can be seen among the 30 specimens from Wotjulum and suggest that *D. australis* and *D. bennetti* are synonyms of a variable species and not subspecies or separate species.

Distribution: The northern part of the State as far south as the De Grey Station and Marrilla Station near Exmouth Gulf. Specimens were also collected on the northern portion of the Canning Stock Route by O. H. Lipfert.

Diporiphora amphiboluroides L. & F.

Woodward's Dragon

Habit moderate, head narrow and somewhat elongate, snout anterior to the nostril, as long as the diameter of the orbit, sharp canthus rostralis, head scales keeled, largest on the snout and between the eyes. A short crest on the snout and two arched ones in front of the eyes which extend backwards to above the tympanum where they merge into a less defined one that disappears on the tail. Scales on the nape very small, smooth or feebly keeled, increasing in size backwards until they merge into the tail where the scales are much larger and more strongly keeled. Limbs also covered with larger, keeled scales. Under surface with smooth or faintly keeled scales, smallest near the gular fold. Limbs short with long digits and unusually long curved claws; the hind limb when adpressed reaches the axilla. Tail one and one-half times the length of the head and body.

Fresh specimens are creamy white with dark brown linear markings which on the head are mostly arranged along the crests. There are also longitudinal streaks along the back and sides, and numerous longer or shorter dark streaks along the lower surface and on the limbs.

Distribution: The southern interior specimens in the Museum come from Mount Sefton, Linden, Belele and Wedgingarra, 30 miles south of Yalgoo. Apparently rare.

Diporiphora winneckei L. & F.

Winnecke's Dragon

Habit slender, head narrow and pointed with sharp canthus rostralis, covered with keeled scales; tympanum moderate. A slight transverse gular fold present or absent. Dorsal scales uniform large, the keels directed to the vertebral line, gular scales almost smooth, ventral scales smooth or feebly keeled; scales on limbs and tail large, more strongly keeled. Tail about $2\frac{3}{4}$ times as long as the head and body, round, tapering. Limbs and digits long with long claws, the adpressed hind limb reaching the neck or tympanum. Pores absent. The largest W.A. specimen measures nearly $7\frac{1}{2}$ in. (190 mm.).

Pale brownish grey with a broad bluish vertebral band and a series of large dark spots on each side divided by a thin white line which extends from the eye over the ear about half way along the back (spirit specimens). Under surface pale with various patterns in thin longitudinal dark lines from the chin to the tail. Tail in one case light with dark spots, in the other, dark with light spots.

Distribution: Originally collected at Charlotte Waters, Central Australia. The two specimens in the W.A. Museum came from Marilla Station, 50 miles from Exmouth Gulf.

(To be continued, with an account of the species of the genus *Amphibolurus*).

THE CATTLE EGRET IN WESTERN AUSTRALIA

By C. F. H. JENKINS, M.A., Government Entomologist.

The Cattle Egret (*Bubulcus ibis*) is a native of the warmer parts of Asia, Africa and southern Europe, but about 25 years ago it suddenly appeared in South America and in the early nineteen fifties made its way to the United States of America.

The history of the bird in Western Australia is somewhat obscure, but it has been well established in the Kimberleys for some time and birds probably referable to this species have been reported from the South-West for the past five or six years. Early in May 1959 Mr. Jim Arbuckle kindly informed me that a dozen unfamiliar, large white birds were tending cattle and horses in a dry swamp on his property at Balcatta, north of Perth. On visiting the area on May 8 I was pleased to see 14 Cattle Egrets closely following the stock around the paddock and darting in to catch flies as they were disturbed by the animals. Since then reports have been received from districts as far apart as Esperance, Ravensthorpe, Bunbury, Bremer Bay, Mt. Barker and Baandee, indicating quite an extensive invasion of the South-West.

In 1933 the Pastoralists' Association advocated the introduction of the Cattle Egret to assist in controlling the tick pest on our Kimberley cattle stations. Twenty birds from India reached the